Resilient Analytics Project Summaries

Alaska's landscape is one of the most diverse in the world. A unique aspect of this landscape is the permafrost that lies under large portions of the state. The prevalence of permafrost has resulted in much of Alaska's infrastructure being partially or completely located in a permafrost zone. As a result, Alaska's infrastructure is highly susceptible to changes in permafrost resulting from changes in temperature.

Alaska is not alone in this risk as states and countries that lie in higher latitudes throughout the globe are experiencing climate-based temperature rises and associated permafrost thaw. The rate of temperature rise across the Arctic has been twice the global average in recent decades. This has led to diminishing sea ice as well as large reductions in land ice. These current and projected changes could significantly damage Alaska's infrastructure. However, there are also significant opportunities to investigate and implement appropriate adaptation measures.

In the current study, Resilient Analytics, Inc focused on the effects of these environmental changes on Alaskan infrastructure and the potential costs associated with maintaining and potentially adapting the infrastructure to projected climate changes. The study utilized downscaled climate data developed by the Scenarios Network for Alaska + Arctic Planning at the University of Alaska, Fairbanks. The study incorporated climate projections for RCP8.5 and RCP4.5 based on five GCMs from the CMIP5 archive. Each selected GCM demonstrated strong affinity for Alaskan and Arctic conditions.

Buildings, roads, railroads, and pipelines were incorporated into the study to determine possible damages and costs that may be associated with changing climate. The results found that the Total cumulative (discounted) damages to infrastructure without adaptation are estimated to be approximately $5.5 billion for RCP8.5 and $4.2 billion for RCP4.5 by 2100.

The distribution of damages varied across the state. The largest damages projected for RCP8.5 were in interior and southcentral boroughs, including Fairbanks North Star, Valdez-Cordova, and Yukon-Koyukuk. The smallest damages were located in the southwest boroughs of Bristol Bay, Lake and Peninsula, and Kodiak Island.

Through preemptive adaption measures, the identified costs can be reduced as well as helping to preserve Alaskan landscapes.

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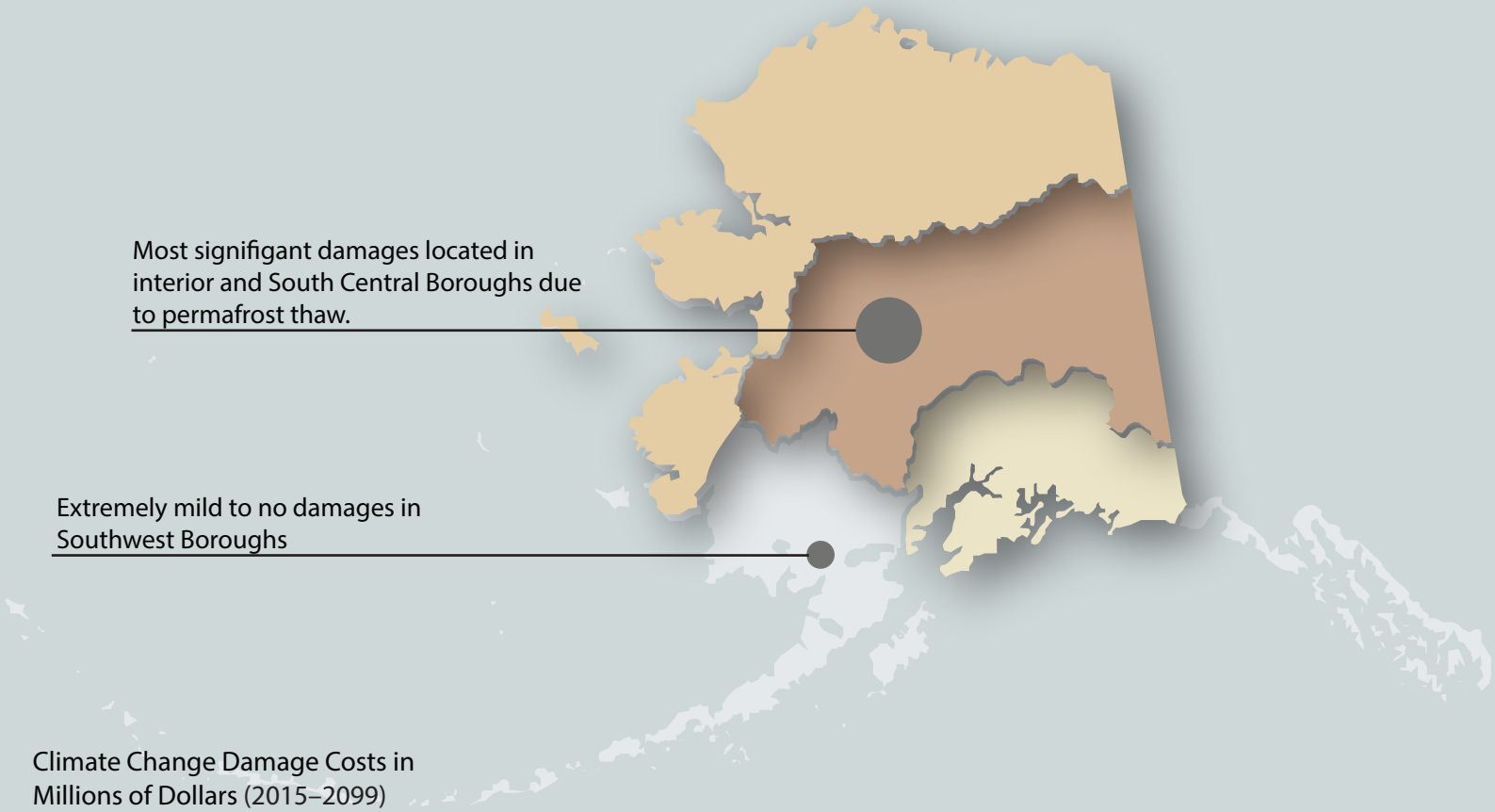
IMPACTS OF CLIMATE CHANGE ON ALASKAN INFRASTRUCTURE



Climate Change Damage Costs in Millions of Dollars (2015–2099)
3% discount, RCP 4.5

< $0	
$10-$100	
$100-$300	
$>300	

Negative costs reflect benefits

Permafrost Thaw:

As Earth's climate warms, the permafrost is thawing. That means the ice inside the permafrost melts, leaving behind water and soil. When permafrost is frozen, plant material in the soil—called organic carbon—can't decompose, or rot away. As permafrost thaws, microbes begin decomposing this material.

About Resilient Analytics

Resilient Analytics answers climate impact questions with the Infrastructure Planning Support System (IPSS). IPSS is a unique, first-of-its-kind system that performs engineering analysis within a broader resiliency perspective. IPSS models infrastructure vulnerability to future climate conditions, considers specific adaptation scenarios, and provides a cost benefit based risk analysis. IPSS draws its data from a range of climate science projections, engineering and materials studies, and environmental research to provide users with decision support that is based in real-world risk scenarios.